



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
**REGION 1**  
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**Boston, MA 02109-3912**

**Memorandum**

**Date:** November 15, 2018

**Subject:** Follow-up to Meeting of October 25, 2018: Reevaluation of Technical Basis for "*Main Street Saddle*" and related CSM elements, initial response

**To:** Jim DiLorenzo, Lynne Jennings, Chris Smith and Jennifer Lambert (Nobis)

**From:** Bill Brandon

**Introduction:**

At the OCSS meeting of October 25, 2018, EPA presented results of significant reevaluations of the existing site database. These independent analyses, made over several months, were combined and synthesized to create a revised CSM for the site which differs from Olin's CSM in significant ways. Despite EPA's efforts in presenting a revised CSM, and extra efforts directed to communicating the analytical approaches and thought process that resulted in the revised CSM, many areas of disagreement remained at the end of the meeting. A list of action items with specific assignments for follow-up was created by Pat Field (Facilitator, CBI).

In response to this charge, this memorandum primarily addresses Olin's request for EPA to review data and analysis supporting EPA's revised bedrock interpretation, particularly with respect to the Main Street bedrock "saddle" feature interpreted by Olin, and the similar "spillway" feature interpreted by EPA to the south. The following comments address these issues in general fashion. A more comprehensive response will be forwarded at a future date.

**General Comments:**

1. Technical basis for Main Street DAPL pool, saddle, spillway and related features/Seismic data: Interpretation of available seismic data that informs interpretation of bedrock saddle under the Main Street DAPL area is equivocal. There does seem to be some basis (from an older seismic refraction line) for the presence of a NE-trending linear ridge, which according to Olin's CSM, buttresses the northwestern flank of the Main Street DAPL pool. The ridge, if real, is interpreted to be at an elevation of ~ 40 ft amsl or just above. The "saddle feature" is just north of the interpreted ridge and is at a slightly lower elevation (33.5 ft amsl). The veracity/accuracy of the seismic data is one of the issues. In the Geomega Main Street Bedrock Saddle Investigation report, (December 19, 2001, page 5, ¶2), it is stated that despite MA DEP's pre-approval of the seismic work, "the results were deemed inconclusive by MA DEP". This is not a strong endorsement of the data quality. It should be mentioned that seismic refraction is generally considered to be a less robust method than the seismic reflection method adopted in later project phases. Further, the one confirmatory boring on the refraction line-of-interest (SB-7) shows an elevation of 35.7 ft amsl where the interpretive TOR contour (presumably based on the refraction data) is 40 ft amsl. Which is correct? What is the refraction-determined-depth-to-bedrock at SB-

7? How do they compare? It should be noted that data of this type typically has a 5-ft or greater 'error bar'. As such, the true elevation of the "ridge" may be lower than current depictions show (e.g., Figure 2.2-9 of the OU3 RI), and if this is the case, the nature/importance of the Main Street Saddle would need to be reevaluated. Further validation of existing seismic data is needed. Please transmit raw data files to EPA/Nobis for further review.

2. Main Street Saddle - TOR depths from borings; As requested, EPA reexamined data from the Appendix D of the remedial investigation and historic Geomega reports to confirm elevation for DAPL spill height relative to the "Saddle" feature. The primary data behind the interpretation which led to the designation of the "Main Street Saddle" feature are the TOR depths estimated from borings SB-7, SB-8, and SB-9. There are some issues with these data. Depth to bedrock at SB-9 was determined to be 64 feet below grade. However, only one foot of 'highly weathered bedrock' was penetrated by this boring from 64-65 ft bgs before the boring was terminated at 65 feet. This does not meet minimum technical standards for determining bedrock depths which typically call for coring at least 5-feet of bedrock to confirm TOR depth. This depth is therefore highly suspect and should not be considered as "confirmed". It is quite possible that the "highly weathered bedrock" interpreted from 64-65 feet bgs is equivalent to the "till" interpreted from 60-64 ft bgs and the distinction was not made in the field due to the disturbance of the geologic materials typically associated with the aggressive Rotasonic drilling method. In such a case, actual bedrock depths may be deeper than presented. Similarly, at SB-7, Rotasonic drilling penetrated "bedrock" from 61-64 ft bgs, with no descriptive information, and no till was reported in the overlying interval. If this represents another false determination of bedrock, this would in turn suggest that the seismic refraction data in the line which included the SB-7 location has a greater error than the 5 feet currently suggested by the 35.7 ft amsl TOR elevation interpreted for SB-7 (as compared to the 40 ft amsl refraction-based elevation). At SB-8, till was encountered from 62-64 feet, followed by a 10-foot interval of "green severely weathered bedrock". A revised interpretation of the Main Street Saddle which objectively addresses the potential bedrock depth measurement errors associated with these techniques may be needed.
3. EPA's "Spillway" feature/TOR data; The "Spillway" feature pertains to an EPA-interpreted NW-trending groove on the TOR surface. Even if the refraction-derived TOR elevations from the line just west of Main Street are validated, there is still room for an interpretation which places a NW-trending trough-like feature extending from the Main Street area northwestward from the area just north of GW-70D/DP-6. There is a 150- to 200-foot gap in coverage along Main Street north of this area where data is negligible to non-existent. Elevations of the trough would be expected to be between 35 feet and 15 feet amsl in this area based on existing information. The "Spillway" interpretation therefore remains viable until there is data of sufficient density to allow for a more resolved depiction of the TOR surface in this part of the site. It is worth mentioning that Figure 21 of the *Main Street Bedrock Saddle Investigation* report shows Geomega's interpretation from that time, which shows a 'tongue' of lower elevation bedrock protruding past Main Street to the northwest into an area of limited data.
4. Fracture characteristics in bedrock beneath Main Street Saddle; Clarification was requested from Olin regarding how we evaluated the "saddle" and its ability to contain DAPL/contaminants. A key aspect of this evaluation concerns bedrock data collected from SB-8/MP-4. Previous reports on which the Olin CSM rely heavily, describe bedrock from this boring as relatively tight, i.e., fractured but of lower hydraulic conductivity than the overlying overburden zones. Olin's CSM

discounts the potential presence of northwest striking features that could be oriented similarly to the northwest-striking “Spillway” feature that EPA interpreted to the south. A closer examination was revealing, and EPA concludes that MP-4 may have indeed intersected steeply dipping hydraulically significant fractures of potential (likely) northwest strike in the lower (deepest) part of the borehole. Regrettably the table of interpreted features from the BIPs log ends at 154.6 feet, suggesting that the interval from 154.6 to 176 feet was either not logged or not evaluated, *but the report and hydro-physical logs note the presence of hydraulically-significant features near the base of the boring*. Steeply dipping fractures were noted on the drillers logs at 154.2, 155.2, 163.8, 166 ft bgs. The logs further note, “iron-stained fractures between 170.5 and 171.5”. The presence of these steeply dipping features, most with dips of 80 degrees to vertical strongly suggests the presence of northwest-striking steeply-dipping fractures in the subsurface near the Main Street “Saddle.” The hydro physical log response and observed oxidation at these deep fractures in turn suggests that they are hydraulically significant. If this condition is verified it may be necessary to revise the CSM regarding the potential for the bedrock beneath the saddle area to transmit DAPL or dissolved constituents to the downgradient areas to the northwest. Please provide the raw digital BIPs data for MP-4 so that EPA may complete additional independent evaluations.